Code No: D-2101/AICTE

FACULTY OF ENGINEERING

BE (Civil) V - Semester (AICTE) (Main) Examination, March / April 2022

Subject: Geotechnical Engineering

Time: 3 Hours **Max marks: 70**

(Missing data, if any may be suitably assumed)

PART – A

Note: **Answer all questions**. **(10 x 2 = 20 Marks)**

1. List various field tests used to identify soils?
2. Define void ratio and Degree of saturation?
3. Describe the held and free moisture in soils?
4. Distinguish between Discharge Velocity and Seepage Velocity in soils?
5. Describe the effects of soil compaction?
6. Define over-consolidation ratio?
7. What are the limitations of direct shear test?
8. What are the advantages of the triaxial compression test?
9. What are types of slope failures?
10. Describe the coefficient of earth pressure for the at rest condition?

PART - B

Note: Answers any five questions. **(5 x 10 = 50 Marks)**

11. a) Differentiate between 'residual' and 'transported' soils? Discuss various types of transported soils?
    b) One cubic metre of wet soil weighs 17.90 kN. If the specific gravity of soil particles is 2.67 and water content is 12%, find the void ratio, dry density and degree of saturation?

12. A clay stratum 8.0m thick is located at a depth of 6m from the ground surface. The natural moisture content of the clay is 56% and Gs = 2.75. The soil stratum between the ground surface and the clay consists of fine sand. The water table is located at a depth of 2m below the ground surface. The submerged unit weight of fine sand is 10.5kN/m3, and its moist unit weight above the water table is 18.68kN/m3. Calculate the effective stress at the centre of the clay? And draw total, neutral and effective stress distribution diagrams.

13. a) Describe various stages of soil compression?
    b) List and describe various Field tests and tools used for Quality assurance of compaction?

14. a) Discuss the significance of shear strength of soils?
    b) The stresses at failure on the failure plane in a cohesionless soil mass were: Shear stress = 6 kN/m2 ; normal stress = 12 kN/m2. Determine the resultant stress on the failure plane, the angle of internal friction of the soil and the angle of inclination of the failure plane to the major principal plane
    Shear stress = 4 kN/m^2 ; normal stress = 5 kN/m^2, Determine the resultant stress on the failure plane, the angle of internal friction of the soil and the angle of inclination of the failure plane to the major principal plane?

15. a) Distinguish between 'active' and 'passive' earth pressures?
    b) Write brief critical notes on 'Taylor's Stability Number?

16. a) Describe various symbols used in classifying the soils?
    b) In a falling head permeability test, head causing flow was initially 50cm and it drops 2 cm in 5 minutes. How much time required for the head to fall to 25cm?

17. a) Describe sedimentation analysis of soils?
    b) A 5m thick clay layer in the field under a given surcharge will undergo 8 cm of total primary consolidation. If the first 4cm of settlement takes 80 days, Calculate the time required for the first 2.5cm of settlement?

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Code No: D-2125/AICTE

FACULTY OF ENGINEERING

BE (MECH/PROD) V – Semester (AICTE) (Main) Examination,
March / April 2022

Subject: Metal Cutting and Machine Tools

Time: 3 Hours **Max. Marks: 70**

(Missing data, if any, may be suitably assumed)

PART – A

Note: **Answer all questions**. **(10 x 2 = 20 Marks)**

1. List out the essential properties of materials used for making cutting tools.
2. Discuss the role of rake angles in single point cutting tool.
3. What are the sources of heat in metal cutting?
4. What are the different types of tool wear?
5. Express the specifications of lathe machine.
6. Explain the various parts of lathe and their functions.
7. How does a grinding wheel is specified?
8. Explain gear hobbing process.
9. List out the differences between jig and fixture.
10. Write short note on clamping devices.

PART – B

Note: **Answer any five questions**. **(5 x 10 = 50 Marks)**

11. a) Discuss the interrelation between ASA and ORS system.
    b) Explain Merchant's analysis for orthogonal cutting.

12 a) Explain tool life for maximum production and minimum cost.
    b) Write short notes on Taylor's tool life equation.

13 a) Define Up milling and down milling.
    b) Sketch quick return working mechanisms of shaper & explain.

14 a) Explain Lapping and honing processes.
    b) Describe gear shaving and what are its applications.

15 a) Write the principle and working of AJM.
    b) Explain the working of ECM with a neat sketch.

16 a) What are the various types of cutting fluids?
    b) Describe various taper turning procedures on lathe

17 a) Explain the geometry of single point cutting tool by (ORS) international system.
    b) Write short notes on temperature effects in metal cutting.

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Code No. D-2107/AICTE

FACULTY OF ENGINEERING

B.E. (EEE/EIE) V - Semester (AICTE) (Main) Examination, March / April 2022

Subject: Microprocessors and Microcontrollers

Time: 3 hours **Max. Marks: 70**

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions. **(10 x 2 = 20 Marks)**

1 Define Microprocessor, microcontroller and microcomputer.
2 Explain the flag register format of 8085.
3 Explain features of 8085.
4 What are the different addressing modes of 8085?
5 Explain the control word format of 8255.
6 Differentiate between memory mapped I/O and I/O mapped I/O scheme.
7 List the various special function Registers in 8051 microcontroller.
8 Explain different I/O ports of 8051.
9 Explain the importance of pins of 8051 : $\overline{PSEN}$ and $\overline{EA}/VPP$
10 Explain the difference between JUMP and CALL.

PART – B

Note: Answer any five questions. **(5 x 10 = 50 Marks)**

11 Explain the architecture of 8085 in detail with neat block diagram.

12 (a) Explain the hardware and software interrupts used in 8085.
(b) Explain bus organization of 8085.

13 (a) What is assembly language programming and assembler?
(b) Write an assembly language program to add two 16-bit numbers.

14 Explain with neat diagram PIT 8253 and its different modes of operation.

15 Explain pin configuration of 8051 and explain the functions of important piris.

16 Explain the addressing modes of 8051 with examples.

17 (a) Explain memory organization of 8051 with diagram.
(b) Explain port operation of 8051 microcontroller.

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FACULTY OF ENGINEERING

B.E. (ECE) V - Semester (AICTE) (Main) Examination, March / April 2021
Subject: Microprocessors and Microcontrollers

Time: 3 hours **Max. Marks: 70**

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions. **(10 x 2 = 20 Marks)**

1 Write the functions of 8086 DT/R' and DEN' signals.
2 Explain the typical memory organization of 8086.
3 With an example, explain the following 8086 instructions.
(i) XLAT (ii) LEA
4 Discuss about the role of debugger in Assembly language programming.
5 Differentiate between Microprocessor and Microcontroller.
6 Give the alternate functions of port 3 in 8051.
7 Explain the configuration of TMOD register.
8 Write an ALP for 8051 to transmit a character "Y" serially at a baud rate of 9600 continuously.
9 Show the design of 8031 based system with 8k byte of program ROM.
10 Interface a DAC to 8051 and WAP to generate a square wave.

PART – B

Note: Answer any five questions. **(5 x 10 = 50 Marks)**

11 (a) Explain the architecture of 8086 with the help of a neat diagram.
(b) Explain the register organization of 8086.

12 (a) Draw and discuss about the interrupt structure of 8086 in detail.
(b) Design the hardware interface circuit for interfacing 8251 with 8086. Set the 8251 in asynchronous mode as a transmitter and receiver with even parity enabled, 2 stop bits, 8-bit character length, frequency 160kHz and baud rate 10K. Write an ALP to transmit 100 bytes of data string starting at location 2000:5000H.

13 (a) Explain about the memory organization of 8051.
(b) Explain the following instructions of 8051 with the help of example.
(i) CJNE (ii) DJNZ (iii) DA (iv) SWAP (v) SUBB

14 (a) Explain the different modes of operation of timer/counter in 8051.
(b) Assume a switch is connected to pin P1.7. Write an ALP for 8051 to monitor its status and send two messages to serial port continuously as follows.
SW = 0 send "NO"
SW = 1 send "YES"
Assume XTA = 11.0592MHz, 9600 baud, 8-bit data and 1 stop bit.

15 Explain the operation of ADC 0809 and WAP to read the data from ADC and convert it into ASCII form.

16 (a) Discuss about the minimum mode of operation of 8086.
(b) With the help of a neat diagram explain the operation of 8255.

17 (a) Explain the architecture of 8051.
(b) Explain the register configuration of SCON and PCON registers.

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Code No. D-2131/AICTE

FACULTY OF ENGINEERING

B.E. (AE) V - Semester (AICTE) (Main) Examination, March / April 2022

Subject: Design of Machine Components

Time: 3 Hours **Max. Marks: 70**

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions. **(10 x 2 = 20 Marks)**

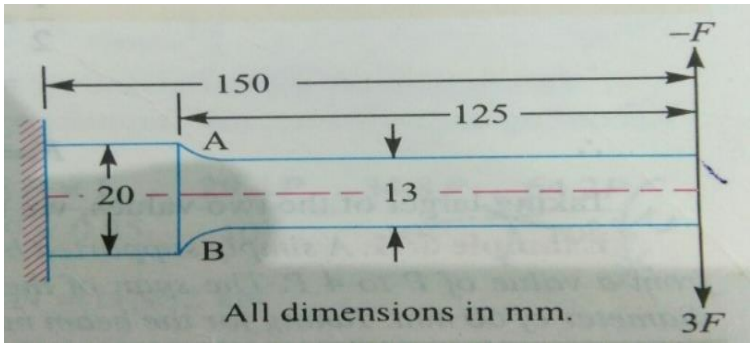
1 Define: (a) Rigidity (b) Toughness.
2 Define Stress concentration factor.
3 The boring bar of a boring machine is 25mm in diameter. During operation the bar may twisted through 0.01 radian, and subjected to a shear stress of 45 MPa. Estimate the required length of the bar.
4 What is the difference between a sunk key and a saddle key?
5 Why are shaft couplings used? Write the names of different couplings types.
6 Write few advantages of chain drives.
7 Define Pitch and Lead of a screw.
8 Write few advantages of chain drives.
9 Differentiate between differential and compound screw.
10 Draw the sketch of Butt weld joints and name them.

PART – B

Note: Answer any five questions. **(5 x 10 = 50 Marks)**

11 The load on bolt consists of an axial pull of 10kN together with a transverse shear force of 5kN. Find the diameter of bolt required according to: 1. Maximum principal stress theory 2. Maximum shear stress theory 3. Maximum principal strain theory. Take permissible tensile stress at elastic limit = 100 MPa and poisson's ratio = 0.3

12 A cantilever beam made up of cold drawn carbon steel of circular cross section as shown in figure is subjected to a load varies from –F to +3F. determine the maximum load that this member can withstand for an indefinite line using factor of safety as 2. The theoretical stress concentration factor is 1.42 and notch sensitivity is 0.9. Assume the following values:
Ultimate stress = 550 Mpa
Yeild stress 470 = MPa
Endurance limit = 275 MPa
Size factor = 0.85
Surface finish factor = 0.89



13 Design and draw a protective type cast iron flange coupling for a steel shaft transmitting 15kW at 200 rpm and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 Mpa. Assume that the same material is used for shaft and key and that the crushing stress is twice the shear stress. The maximum torque is 25% greater than full load torque. Shear stress for cast iron is 14 MPa.

14 A shaft made of mild steel is required to transmit 100 kW at 300 rpm. The supported length of the shaft is 3 meters. It carries two pulleys each weighing 1500N supported at a distance of 1 meter from the ends respectively. Assuming the safe stress determine the diameter of shaft.

15 Design a knuckle joint to withstand a load of 100kN. All parts of the joint are made of same material with $\sigma_{ut} = \sigma_{uc} = 480$ MPa, and $T_u = 360$ MPa. Use factor of safety of 6 on ultimate strength.

16 A double riveted lap joint is made between 15mm thick plates. The rivet diameter and pitch are 25mm and 75mm respectively. If the ultimate stresses are 400 Mpa in tension, 320 MPa in shear, and 640 MPa in crushing find the minimum force per pitch which will rupture the joint. If the above joint is subjected to a load such that the factor safety is 4, find out the actual stresses developed in the plates and rivets.

17 Write short notes on:
(a) Miner's rule of cumulative fatigue
(b) Locking devices for nuts
(c) Differential and compound screws.

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Code No. D-2400/AICTE

FACULTY OF ENGINEERING

B.E. (CME) V - Semester (AICTE) (Main) Examination, March / April 2022

Subject: Automata Theory and Compiler Design

Time: 3 Hours **Max. Marks: 70**

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions. **(10 x 2 = 20 Marks)**

1 Distinguish between DFA, NFA and ε – NFS.
2 List the closure properties of Regular Language.
3 Construct a PDA equivalent to CFG. S->0AA, A->0S|1s|0.
4 State pumping Lemma for Context Free Languages.
5 What is restricted Turing Machine?
6 Distinguish between recursive and recursively enumerable languages.
7 Define Bootstrapping and porting.
8 What is the role of parser in the compiler?
9 Write the strategies used for error recovery during syntax analysis.
10 Define S-attributed and L-attributed grammar. Give example.

PART – B

Note: Answer any five questions. **(5 x 10 = 50 Marks)**

11 Convert the following NFA to DFA using subset construction method.

12 Design a PDA for Language L={wcw^r where w ϵ (a+b)*}.

13 Design a TM for multiplication of two numbers using sub routine.

14 Draw the block diagram of phases of a compiler and indicate the main function of each phase.

15 Construct the SLR parsing table for the given grammar by performing LR(0) automation. And trace the string ((a))

E → E + T | T, T → a | (E)

16 (a) Convert the following grammar into CNF

S → a |aA | B

A → aBB | ε

B → Aa | b

(b) Construct the Predictive parsing table for the given grammar and verify whether the following grammar is LL(1) or not

E→TE', E'→+TE'| ε, T→FT', T'→*FT'| ε, F→(E) |id.

17 Write short notes on:
(a) Chomsky's Hierarchy (b) YACC.

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Code No.D-2135/AICTE

FACULTY OF ENGINEERING

B.E. (CSE) V - Semester (AICTE) (Main) Examination, March / April 2022

Subject: Professional Elective – I
Artificial Intelligence

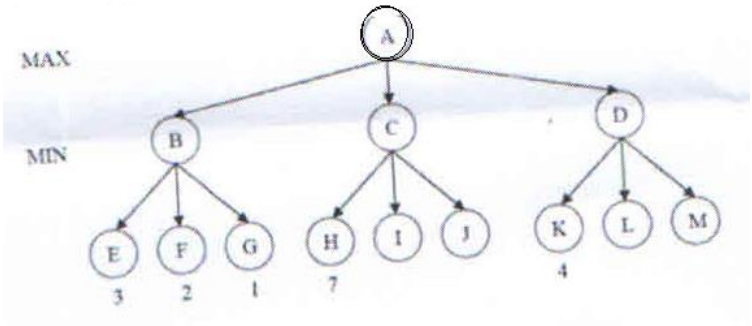
Time: 3 hours **Max. Marks: 70**

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions. **(10 x 2 = 20 Marks)**

1 What can be evaluation function value at nodes I, J, L, M so that they are pruned when using alpha beta pruning on the given tree?



2 Explain the importance of Turing Test.

3 If P(x, y) represents x plays y where domain of x is students and y is sport convert the following into English:
(a) ∀x CSE(x) ⇒ P(x, Cricket) V P(x, Chess)
(b) ~∀x∀y CSE(x) ∧ Cricket(y) ⇒ P(x, y)

4 Explain how knowledge is represented using Semantic network.

5 What is utility theory?

6 Explain membership function in fuzzy set theory using an example.

7 Differentiate between active and passive reinforcement learning.

8 Compute Information gain of the attribute X.

X	1	0	1	1	0	0	1	0
Class	T	T	F	F	T	T	F	F

9 List two achievements of AI in games.

10 Show a parse tree for the sentence: Ram works in a college.

PART – B

Note: Answer any five questions. (5 x 10 = 50 Marks)

11 (a) Given a sliding tile puzzle with three tiles and a blank (0 represents blank) with the following initial and final states. The operators are move blank right, left then, up and then down in that order. Exhibit the first 4 nodes that will be expanded by DFS and BFS.

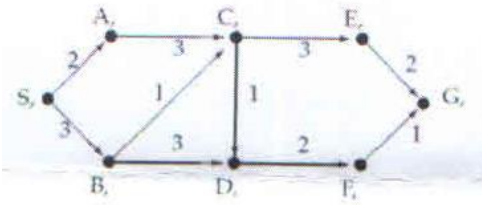
0	1
3	2

initial State

1	2
0	3

Goal

(b) The graph below represents the search space of a problem. Nodes are labeled with a letter and edges are labeled with the cost of traversing the edge. Heuristic function value h for the node are mentioned in the table



n	S	A	B	C	D	E	F	G
h(n)	9	8	6	5	4	3	1	0

12 (a) What is resolution refutation? Convert the following into FOL and use resolution to prove the conclusion.

(i) Whoever can draw is an artist

(ii) All students are not artists

(iii) Some students are smart

Goal : Some who are smart cannot draw

(b) Explain partial order planning.

13 (a) What is Bayes network? Design a simple diagnostic system using Bayesian Inference. Has Flu (True or not). Two possible causes: Cold (C) and Weakness (W) P (C) = 0.6, (a) Draw the Bayesian Network (with CPTs)

P (W) = 0.4

P(HF / ¬C, ¬W) = 0.0 (b) Compute P(HF / C)

P(HF / ¬C, W) = 0.5

P(HF / C, ¬W) = 0.7 (c) Compute P(~HF , C , ~ W)

P (HF / C, W) = 0.8

(b) Explain steps involved in fuzzy Inference System.

14 Draw a multi-layer feed forward neural network for 2 inputs, 2 hidden layers and 1 output. Explain training using back propagation in multilayer feed forward neural network.

15 (a) Explain the phase / steps in Natural Language Processing.

(b) Discuss the challenges involved in Automatic Speech recognition system.

16 (a) Explain the architecture of expert system.

(b) List four rules of inference in Proposition Logic. Prove using Inference rules: From P→(~Q → R) and ~(QV ¬ R) Infer ~ P

17 Briefly explain the following:

(a) General model of learning Agent

(b) Evaluation function used for Adversarial Search taking the example of Tic Tac Toe game.

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Code No.D-2137/AICTE

FACULTY OF ENGINEERING

B.E. (CSE) V - Semester (AICTE) (Main) Examination, March / April 2022

Subject: Professional Elective – I
Image Processing

Time: 3 Hours **Max. Marks: 70**

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions. **(10 x 2 = 20 Marks)**

1 List the applications of digital image processing.
2 Define Sampling and Quantization.
3 Distinguish between spatial domain and frequency domain.
4 List the properties of 2-D Discrete Fourier Transform.
5 What is the need for image restoration?
6 Give the probability density function for the Erlang noise model.
7 Define Scaling in a wavelet transform.
8 What are the characteristics of lossy compression?
9 Write the mask for prewitt operator.
10 List the applications of morphological image processing.

PART – B

Note: Answer any five questions. **(5 x 10 = 50 Marks)**

11 (a) List and explain the components of digital image processing.
(b) Explain Histogram Equalization with an example.

12 (a) Explain the following gray level transformations
(i) Contrast enhancement (ii) Power Law Transformation.
(b) Explain the basic steps for filtering used to enhance an image in frequency domain.

13 (a) Draw and explain model of image degradation/restoration process.
(b) Discuss Constrained Least Squares filtering.

14 (a) Explain how the Noise reduction can be done on an image by using wavelet analysis.
(b) Discuss lossless predictive coding.

15 (a) Explain about the Global processing via the Hough Transform for edge linking.
(b) Write about the importance of Hit-or-Miss morphological transformation operation on a digital binary image.

16 (a) Write short notes on distance measures between pixels.
(b) What is the importance of a mask spatial filtering used for image enhancement?

17 (a) Explain about JPEG compression standard and the steps involved in JPEG compression.
(b) Discuss the opening in image morphology with an example.

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Code No. D-2151/AICTE

FACULTY OF ENGINEERING

B.E. (I.T.) V - Semester (AICTE) (Main) Examination, March / April 2022

Subject: Professional Elective – I
Artificial Intelligence

Time: 3 Hours **Max. Marks: 70**

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions. **(10 x 2 = 20 Marks)**

1 Define Intelligence and Specify the sub areas of AI.
2 List out the various types of Problem.
3 Define Completeness and Optimality.
4 Define A* algorithm.
5 What is a Random search?
6 Define Temporal Model in Probabilistic Reasoning.
7 What is Transitional model in HMM?
8 Define Utility theory in MDP.
9 What is a Markov Decision Problem?
10 List out the types of Reinforcement Learning.

PART – B

Note: Answer any five questions. **(5 x 10 = 50 Marks)**

11 (a) Explain about various types of Intelligent systems.
(b) Write about state space search.

12 Describe about Best first search algorithm in detail with an example.

13 Write the Bayes Theorem and illustrate the working of Basien Belief Network.

14 What is a Markov decision process? Explain the policy and optimal policy in MDP with an example.

15 Write about the Adaptive dynamic Programming.

16 Explain passive reinforcement learning and active reinforcement learning.

17 (a) Distinguish between Value Iteration and Policy Iteration
(b) Compare Uniformed search and Informed search.

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Code No. D-2152/AICTE

FACULTY OF ENGINEERING

B.E. (I.T.) V - Semester (AICTE) (Main) Examination, March / April 2022

Subject: Professional Elective – I
Computer Graphics

Time: 3 Hours **Max. Marks: 70**

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions. **(10 x 2 = 20 Marks)**

1 Distinguish between passive-matrix and active-matrix displays.
2 Consider raster systems with resolution of 1280 by 1024. What is the size of frame buffer (in bytes) needed for each of this system to store 12 bits per pixel.
3 List different Text Attributes.
4 What are affine transformations?
5 What is window in computer graphics terminology?
6 What is exterior clipping?
7 What are editing structures?
8 Define three types of input modes.
9 Write down the properties of Bezier Curves.
10 Write about Z-Buffer method.

PART – B

Note: Answer any five questions. **(5 x 10 = 50 Marks)**

11 (a) Distinguish between Random Scan and Raster Scan Displays.
(b) Explain about Bresenham's Line Algorithm and give advantages of Bresenham's algorithm over DDA.

12 (a) Discuss the process of character generation.
(b) With necessary equations explain fixed point scaling transformation.

13 Describe Cohen Sutherland line clipping algorithm. Using this algorithm clip the following line segments against a window $wx_1 = 50$, $wy_1 = 50$, $wx_2 = 100$, $wy_2 = 100$

(i) line P_1P_2 $P_1(80, 30)$ $P_2(90, 60)$
(ii) line P_3P_4 $P_3(60, 60)$ $P_4(70, 70)$
(iii) line P_5P_6 $P_5(30, 70)$ $P_6(70, 120)$
(iv) line P_7P_8 $P_7(120, 60)$ $P_8(125, 80)$

14 Write in detail about Interactive – Picture construction techniques.

15 Explain the constructive solid geometry method Octree.

16 How are transformations between co-ordinate systems done?

17 Write short notes on following:
(a) Flat Panel Displays.
(b) Text Clipping.
(c) Projection operations.

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Code No. D-2136/AICTE

FACULTY OF ENGINEERING

B.E. (CSE) V Semester (AICTE) (Main) Examination, March / April 2022
Subject: Professional Elective – I
Advanced Computer Architecture

Time: 3 hours **Max. Marks: 70**

(Missing data, if any, may be suitably assumed)

PART – A

Note: Answer all questions **(10 x 2 = 20 Marks)**

1 What is conceptual meaning of Computer Architecture?
2 What is the role of benchmarks in measuring performance of computer systems?
3 What is the difference between a direct and an indirect address instruction?
4 Illustrate CALL instruction in assembly language.
5 Perform the operation (-9) + (-6) = -15 with binary numbers in signed – 1's complement.
6 Why should the sign of the remainder after a division be the same as the sign of the dividend?
7 What is the clock cycle time in a pipelined processor?
8 What is static branch prediction?
9 What is locality of reference?
10 What is the difference between memory – mapped I/O and isolated I/O?

PART – B

Note: Answer any five questions **(5 x 10 = 50 Marks)**

11 a) Explain software-hardware interface with reference to advanced computer architecture.
b) Discuss the guidelines and principles to evaluate the performance of computer systems.

12 a) Explain how operations are performed in the instruction set.
b) Discuss addressing modes with suitable examples.

13 a) How to perform Arithmetic Operations? Explain
b) Write an algorithm for subtracting numbers with signed-2' s complement

14 a) Name different stages of pipelined architecture and explain them.
b) Discuss pipeline hazards.

15 a) Explain address mapping using pages in virtual memory.
b) Draw the block diagram for DMA controller and explain about DMA transfer in a computer.

16 a) How the performance of a system can be measured?
b) Define an instruction format? List the types of instruction formats.
c) If the processor has forwarding, but we forgot to implement the hazard detection unit, what happens when this code executes?

17 a) What is cache coherence problem and when do you say a memory system is coherent?
b) Discuss Redundant Arrays of Inexpensive Disks.

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Code No: D-3600/CBCS

FACULTY OF ENGINEERING

B.E (Civil) V - Semester (CBCS) (Backlog) Examination, March / April 2022

Subject: Hydraulic Machines

Time: 3 Hours **Max. Marks: 70**

(Missing data, if any may be suitably assumed)

PART – A

Note: **Answer all questions**. **(10 x 2 = 20 Marks)**

1. Different between Reynolds number and Weber number
2. What are the major modeling methods in Dimensional analysis?
3. Discuss various types of Pumps.
4. Explain why Priming is needed in pumps.
5. Define suction specific speed
6. Mention significance of Draft tube
7. Define manometric and mechanical efficiency of a centrifugal pump.
8. Classify Turbines according to specific speed.
9. State the advantages of Reciprocating pumps.
10. Differentiate between Turbine and Pump.

PART - B

Note: Answers any five questions. **(5 x 10 = 50 Marks)**

11. a) A model of submarine is scaled down to 1/20 of the prototype and is to be tested in a wind tunnel where free stream pressure is 2.0MPa absolute and temperature is 50^{o}C. The speed of the prototype is 7.72m/s. Determine the free stream velocity of air and the ratio of the drags between model and prototype. Assume kinematic viscosity of sea water as 1.4 x 10-6 m^2/s and viscosity of air as 0.0184 cP.
    b) Derive the draft tube efficiency formula in case of reaction turbine.

12. a) What is cavitation phenomena. Discuss how does it occur and prevention methods.
    b) Draw a neat diagram of Centrifugal pump and explain each component.

13. a) A hydraulic turbine is to develop 1000kW when running at 400 rpm under a heat of 10m. Determine the specific speed and maximum flow rate for the turbine if the overall efficiency is 90%. In order to predict its performance, a 1:10 scale model is tested under a head of 6m. Determine the speed, water consumption and power output of the model if it runs under the conditions similar to the prototype.
    b) Discuss the performance characteristic curves for turbines with neat diagram.

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14. a) Explain under which conditions multistage pumps are needed with neat sketch with relevant equations.
    b) A jet of water of 20mm diameter and moving at 15m/s, strikes upon the centre of a symmetrical vane. After impingement, the jet gets deflected through 160^{o}by the vane. Presuming vane to be smooth determine : (i) The force exerted by jet on the vane, and (ii) The ratio of velocity at outlet to that at inlet if actual reaction of the vane is 127 N.

15. a) A wind tunnel is used to test 5:1 scale model of a car. The velocity with prototype is 60 km/hr and for the dynamic similar conditions, the model drag is 240 N. If air is used with model as well as the prototype, then determine the drag and the power required for the prototype
    b) What are Indicator diagrams. Discuss the effect of Acceleration on indicator diagram.

16. a) A centrifugal pump impeller runs at 80 r.p.m and has outlet vane angle of 60^{o}. The velocity of flow is 2.5m/s throughout and diameter of the impeller at exit is twice that at inlet. If the manometric head is 20m and the manometric efficiency is 75 percent, determine: (i) The diameter of the impeller at the exit, and (ii) Inlet vane angle.
    b) Explain the functions of air vessels in a reciprocating pump.

17. Write short notes on any **TWO** of the following
    a) Net positive suction head (NPSH).
    b) Reciprocating pump.
    c) Hydraulic efficiency.

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